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CUTTING A REDWOOD TREE

THE National Geographic Magazine

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THE REDWOOD FOREST OF THE PACIFIC COAST

By HENRY GANNETT,

U. S. Geological Survey

Redwood is so called because of its color, which, when freshly cut, is a bright, though not deep, red, changing to a brown-red when thoroughly seasoned. The wood is soft, with a rather coarse, straight grain. It is easy to work, quite as much so as our eastern white pine. It contains practically no resin, but a large amount of water, which makes the green wood so exceedingly heavy that often the lower log of a tree will sink in water.

Botanically, the redwood (*Sequoia sempervirens*) is a brother of the big trees (*Sequoia gigantea*) of the Sierra Nevada, the two species being the sole living representatives of the genus *Sequoia*. It is a cousin of the cedars, which it resembles in many respects, in habit and appearance, in bark and foliage. It is an immense tree, larger than the fir of Washington, but not as large as the Big Tree of the Sierra. It often attains a height exceeding 300 feet and a butt diameter of 15 feet. It rarely branches low, but almost invariably shows a straight, buttressed trunk, perfectly symmetrical rising with a slight taper for 200 feet to the lower branches. The bark is covered with thin flakes of epidermis, lying parallel to the stem. The foliage is dull green in color, fine and drooping. It is a most beautiful tree, both in form and color.

The habitat of the redwood is peculiar. It is found only in a narrow strip, closely hugging the Pacific coast, stretching from the southern boundary of Oregon or just across the boundary—for there are perhaps 1,000 acres of redwood in Oregon—south-



MAP SHOWING THE QUANTITATIVE DISTRIBUTION OF ALPINE VEGETATION IN THE EASTERN COAST
 Area covered by forest indicated in black

ward through northern California, nearly to the bay of San Francisco. Indeed, a few scattering groves are found south of the bay, in Santa Cruz county and other localities, and there are evidences that not many centuries ago it extended over the Coast ranges as far south as Los Angeles; but in all this region it is now practically extinct. The densest forests are found in Humboldt county. In Del Norte county, on the north, the area is comparatively small and the forests somewhat less dense; while in Mendocino county, on the south, where the redwood area is even greater than in Humboldt, the forests are not as dense, and in Sonoma county, still farther south, the timber becomes more scattering, thinning out into groves. Its habitat is a region of heavy rainfall, which comes in the winter, and of fogs which sweep in from the Pacific at all times of the year. It is a very moist, temperate region, both of which conditions appear to be essential to the growth of the species. On the north its range is probably limited by temperature, since the humidity is even greater in Oregon and Washington than in California. On the south it is probably limited by the diminishing amount of hu-



Redwood forest, Humboldt county, California. (Photograph by J. H. Rouse.)

richly. The species seems to require for its development a rather nice adjustment of temperature and moisture conditions, which are not found elsewhere, and, as will be seen later, do not at present fully meet the needs of the species, even in its present habitat.

This is probably the densest forest on earth, as measured by the amount of merchantable timber—that is, of timber suitable for the saw-mill—contained per acre. It is not the size of the trees alone which produces this, although they are exceptionally large, even in this state of large things, but it is the great number of trees on each acre, the closeness of their stand. In a redwood forest the sun never shines—it is always twilight. You are, as it were, under the roof of a vast temple, a roof of foliage, supported by great tree columns.

In order to obtain a conception of the enormous stand of timber in the redwood strip, let us commence with some familiar examples for comparison.

The great pineries of the southern states contain, on an average, about 5,000 feet, board measure, of standing timber per acre. Of white pine the heaviest county in Minnesota is estimated to contain an average of 5,000 feet, while others, regarded as forested, contain 1,000 to 2,000 feet; and a tract containing 10,000 feet per acre is regarded as heavily forested. Contrast these figures with the following: The average stand of redwood upon 173,000 acres in Mendocino county is 44,000 feet per acre. There is here nearly nine times as much timber on no acre as in the southern pineries; yet even this is exceeded in Humboldt county. Upon 101,443 acres in this county the average stand is 84,000 feet per acre, nearly seventeen times as great as in the southern states. The lumber companies around Eureka, California, the principal center of the redwood industry, have realized, since they commenced operations, an average of between 75,000 and 100,000 feet per acre, and one of these companies has for ten years cut an average of 84,000 feet per acre of redwood alone, besides fir and spruce, which would increase the amount to nearly 100,000 feet. These last figures are not in any way estimates, but the actual products of the mills. The disproportion is even greater than appears here, for the standard for lumber used in the redwood country is much higher than in the east, and consequently the estimates of the amount of timber are correspondingly less. For instance, whereas in the east logs

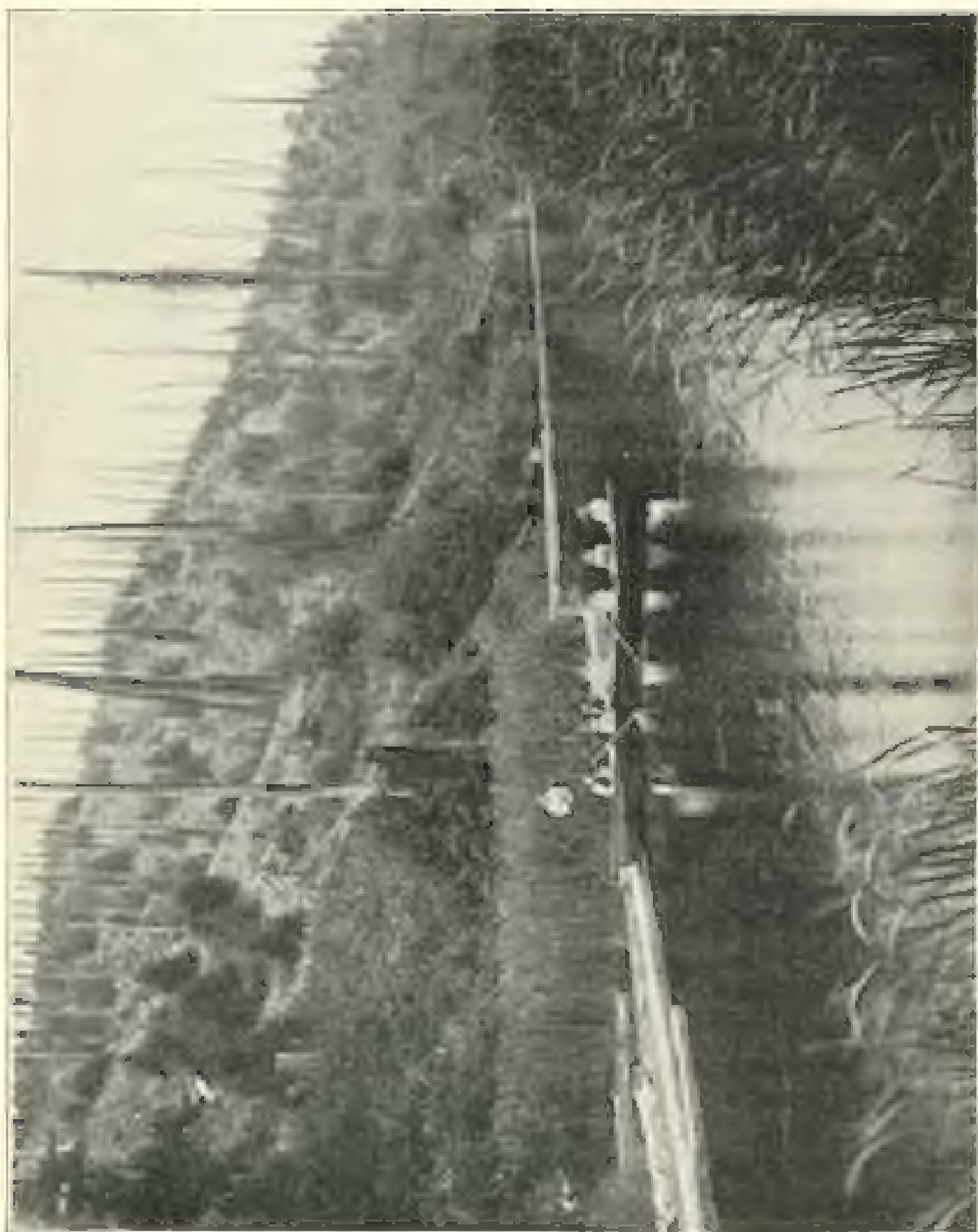
eight inches in diameter are cut and sent to the mill, and knotty stuff is sawed, on the Pacific coast nothing less than 16 inches in diameter is sawed, and clear lumber only. If the redwood were used as economically as the southern pine, these estimates of its stand might easily be 50 per cent greater. The forests of Washington and Oregon are very heavy, but they by no means equal the redwoods in density. The most heavily forested county in Washington, Skagit, contains an average on its forest land of but 28,000 feet per acre, and in Oregon the stand is no greater. Of course, there are in these states individual acres, and even square miles, which are vastly more heavily forested; but so also, are there in the redwood strip. On Mad river, near Eureka, a lumber company is at work in a tract of several square miles which actually cuts 150,000 feet per acre.

There is on record a single acre, near Garberville, which yielded in the mill 1,431,380 feet in lumber. There was sufficient lumber on this acre to have covered it with a solid block of frame dwellings ten stories high. A redwood tree of average size, say five feet in diameter at the butt, furnishes enough lumber to build an ordinary cottage, and many trees have been cut each of which would suffice for half a dozen such houses. One tree is on record as having scaled 63,500 feet. A tree was felled in a lumber camp near Eureka in 1898 which was 16 feet in diameter inside the bark, and which scaled over 100,000 feet, and there is standing in the same neighborhood a tree 22 feet in diameter which scales nearly twice as much. Such examples of wonderful yield might be multiplied to any extent, but this would merely involve repetition.

The redwood strip is composed of the westernmost of the Coast ranges, with the valleys between them. It is narrow at the north, in Del Norte county, where it is not over five to six miles in breadth. It widens in Humboldt county to an average of 10 to 12 miles; then south of Red river, in the southern part of the county, its continuity is broken for a few miles. At the north edge of Mendocino county it commences again, and in the central part of that county attains its greatest breadth, of perhaps 20 miles. Farther south, especially in Sonoma county, the redwoods scatter, being found in detached clumps and groves, which become more and more scattering southward. The trees, however, remain as large as elsewhere.

The closest and finest growth is in Humboldt county, near the northern end. That portion in Mendocino and Sonoma counties

STEAMER SIGHTED ON CUBA ABATE



is not as heavy as elsewhere, nor are the trees as valuable for lumber, as they bend lower down. The wood is, however, of the same sort, is denser and harder and perhaps more durable. The trees, however, are fewer and grow as everywhere in the valleys and on the flats. The densest of the trees are so small and not so close. Nowhere is there any young growth. The oldest trees, which are few, only in the northern portion of the belt are several hundred years old.

Although there is here and there a sign of a product from seed, in many places sprouts are growing from stumps on the cut areas, and even trees of repeated growth are to be seen, everything appears to indicate that for some reason, probably a progressive drying of the climate, the present forest is not so good for the growth of reforestation, and that with the coming away of the present forests the seed of the same does not survive in the soil as it does here.

The area of the redwood belt has been carefully mapped, and as nearly as can be estimated, 2,000 square miles, or 1,280,000 acres. The extent of the bottom lands is not so easy to determine. The figures given above in the article on the redwood have been obtained by dividing approximately the amount in Redwood County out of 17,000 acres of redwood land (13,000 acres given) and to extend to an average stand of 100,000 trees per acre, an area of 100,000 acres. In 1914 there were 1,800,000 trees with a range in diameter from 20,000 to 200,000 feet. These 1,800,000 trees are surrounded by the rest of the forest, and are in the very center of the forest, where nearly all the timber is of the same size. The companies report an average yield of between 7,000 and 10,000 feet per acre. In Mendocino County, out of a redwood area of 400,000 acres, 170,000 acres are reported to contain an average of 140,000 feet with a range from 12,000 to 200,000 feet. In Sonoma County the timber is so scattered that the total amount which is reported over an area of about 75,000 acres, is approximately 200,000 feet.

If the above figures are taken as the minimum, the total redwood belt is about 1,280,000 acres.

Redwood County	4,000,000,000
El Dorado County	42,000,000,000
Mendocino County	28,000,000,000
Sonoma County	1,000,000,000
	4,480,000,000

To appreciate the magnitude of these figures it may be said that the annual cut of lumber and shingles of the United States is about one-third of this amount. The redwood strip alone would therefore supply the entire country with lumber for three years.

Many estimates of the amounts of standing redwood have been made, with results widely at variance with one another. The area of the belt has long been pretty well known, and these estimates among the estimates would be the most reliable. The first estimate made for the entire belt was made in 1881 by John Hoover, of Berkeley, who gave 13,000,000 cubic feet. At about the same time Mr E. L. Allen, secretary of the Redwood Manufacturers' Association of San Francisco, made the estimate for the belt in the report of the tenth census, which was 20,825,000 cubic feet. In 1885 A. F. Hansen, Assistant Forester, in the report of the California State Board of Forestry, made an estimate of 19,500,000 cubic feet. In 1890 C. L. Allen, Secretary of the United States Lumber Manufacturers' Association of Portland, estimated it at 17,000,000 cubic feet.

The area seems to be generally agreed upon as being from 1,000,000 to 1,200,000 acres. The measurements from the last report available, that of the State Board of Forestry, give the latter figures. It is out of the question that the redwood belt is a uniform average, so wide as 20,000 to 40,000 feet per acre. An estimate of standing and records of cut show yields far in excess of these figures, and I can only hope to suggest that these estimates would not be applicable to selected areas far above the average. There is a yet, very imperfect selection of timber lands being purchased. The whole territory is so heavily forested that it is impossible to get a correct estimate of the value of the timber on the land now available. The only estimate which we have been able to secure of a tree, only a few inches in diameter and by and by not much at present. I consider, therefore, the figures quoted above with care, possibly 20,000,000 cubic feet of 12,800,000, or a very rough estimate of the entire area together with the records of the entire harvest cut in the whole country. I wish to say for sample that the estimate of the late Captain Finck's estimate seems to me, if correct, to be very exaggerated and too high, but I have no reason to doubt but it will and will eventually be cut from the belt owing to the enormous loss to be effected in the future.

The wood is used by the mills, excelling other species in value for many respects such as firewood, saw-gum, timber, posts, and poles—



traded by a great number of persons. A fair number of lumber companies have large holdings, assuming the 250,000 acres also to be taken up by holdings, it is possible that

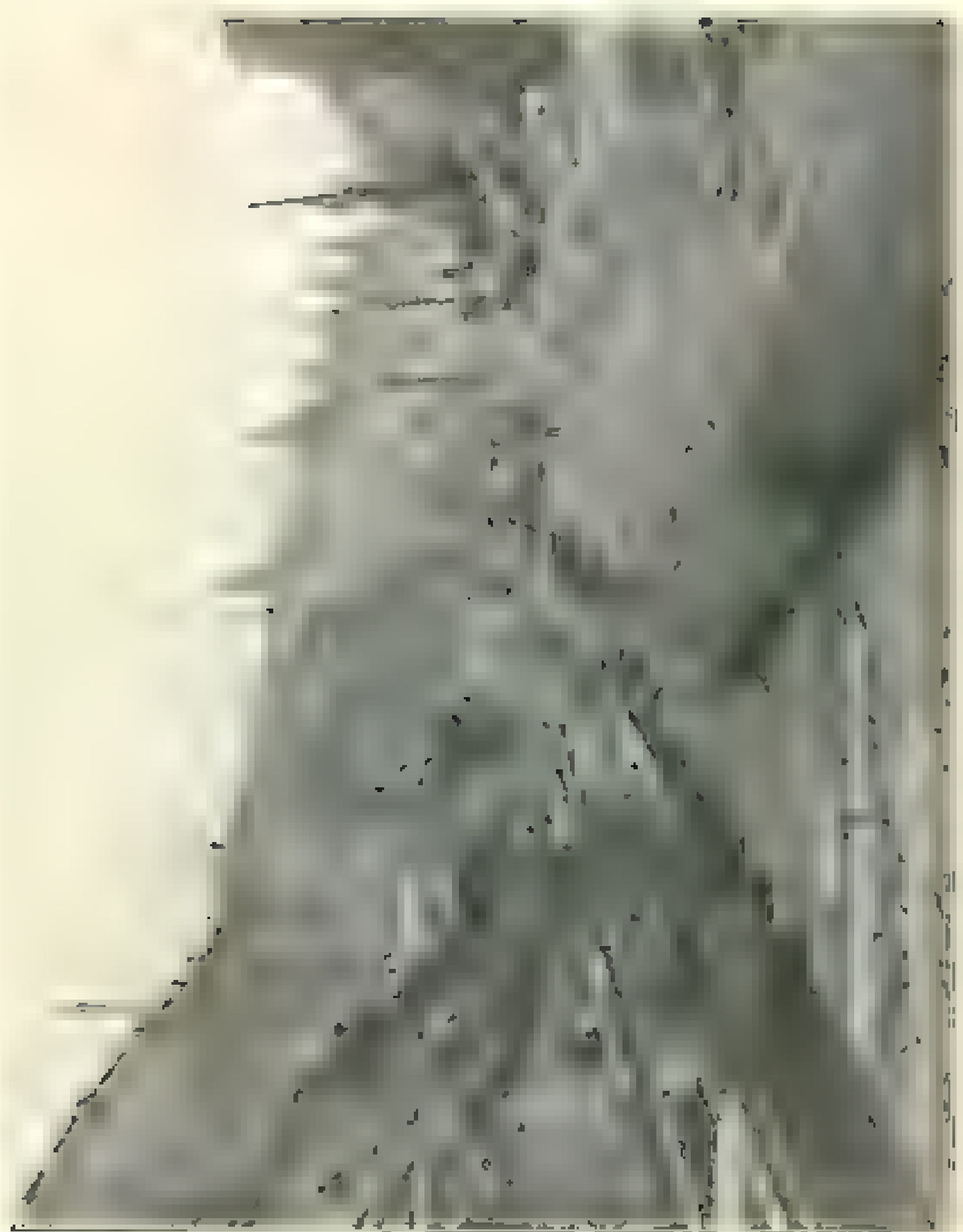
of a quarter section, 160 acres of area there were	8000
from 1 section to a section 160 acres	4000
from 1 section to 4 sections	4000
from 4 sections to 16 sections	1000
from 16 sections to 64 sections	1000
from 64 sections to 256 sections	1000

The last were traces of 300,000, 200,000, and 100,000 acres. The above are the holdings of lumber and timber companies. Whether this classification properly represents the character of the holdings of the entire timbered land. It is probable that the holdings of these timber owners of tracts of logging camps are small.

The forest is nearly pure redwood. Occasionally, some Douglas fir, but is rare. It is found in some places to percent of the forest only. The southern part of the forest is, on the whole, composed of younger trees than the northern part, and the wood is denser and of less mixed growth. In the north the ground is covered with trees not more than 200 or 300 years old, while the age of the mature trees reaches several hundred years or a thousand years. The northern part shows that the north, especially in the younger part, the growth is several times as fast as the southern part of the forest.

The wood is used in large quantities in the lumber industry. It is employed in the great fir forests of Washington, it is brought a million miles to the West coast of the United States. It is used in the construction of houses, for driving the logs to the woods is over; so are the days of driving logs on streams. More and more the logs are in various ways, I would not be surprised to find a great many of the log sawing are here in the future. In every

part of the logging camp, a redwood is cut down. They are then cut up to 100,000, 200,000, 300,000, 400,000, 500,000, 600,000, 700,000, 800,000, 900,000, 1,000,000, 1,100,000, 1,200,000, 1,300,000, 1,400,000, 1,500,000, 1,600,000, 1,700,000, 1,800,000, 1,900,000, 2,000,000, 2,100,000, 2,200,000, 2,300,000, 2,400,000, 2,500,000, 2,600,000, 2,700,000, 2,800,000, 2,900,000, 3,000,000, 3,100,000, 3,200,000, 3,300,000, 3,400,000, 3,500,000, 3,600,000, 3,700,000, 3,800,000, 3,900,000, 4,000,000, 4,100,000, 4,200,000, 4,300,000, 4,400,000, 4,500,000, 4,600,000, 4,700,000, 4,800,000, 4,900,000, 5,000,000, 5,100,000, 5,200,000, 5,300,000, 5,400,000, 5,500,000, 5,600,000, 5,700,000, 5,800,000, 5,900,000, 6,000,000, 6,100,000, 6,200,000, 6,300,000, 6,400,000, 6,500,000, 6,600,000, 6,700,000, 6,800,000, 6,900,000, 7,000,000, 7,100,000, 7,200,000, 7,300,000, 7,400,000, 7,500,000, 7,600,000, 7,700,000, 7,800,000, 7,900,000, 8,000,000, 8,100,000, 8,200,000, 8,300,000, 8,400,000, 8,500,000, 8,600,000, 8,700,000, 8,800,000, 8,900,000, 9,000,000, 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with about 75 men, and several thousands of round and flat all-black tin cups—frees I understand—being for the most part out to which they took, but we heard this night that it was a fair exchange of the cups for the world.

The ends of the redwood strip are as follows: (a) by the ends of the logging operation. The logs and the stumps are piled and banded everywhere by the company. The stumps, tops and limbs are piled on to the carriage and truck. They are then sawed by rollers and are separated by rollers. The logs are sawed by band saws on either side of the log with the log cut on the edge. The only over-drums are on the saw. There is preference in the circular saw for the redwood. If one saw a log of a most any size, we will saw it on one end and cut it off in two saws on the other. The second, or more, can be made in a short time and can be as good as the first. If wood is wanted, it is no use to stop. The logs have to be cut on one side, so that a pile may be made. Let the log be cut forward as a board. The narrow end is joined, or k, and the log is cut from the end saw. The saw are directed by rollers along the wheel, to the proper parts of the mill for future cutting. The other end of waste are generally carried off to waste-heaps. The number of stumps for the band saw, is enough, cut by a roller, or by saw on either side, or by saw on one side and a roller on the other, so that several logs are made at once.

where the whole system \mathbf{L} is a 6×6 matrix, \mathbf{g} is a 6×1 vector, \mathbf{L}^{-1} is the inverse of \mathbf{L} , and $\mathbf{L}^{-1}\mathbf{g}$ is a 6×1 vector.

The wood is a natural fire retardant and is fire resistant. It is not treated with chemicals to make it fire resistant, even as the wood is in Los Angeles and San Francisco. It is expensive as far south as New Orleans, and it was sold today at about 1/2 price in a local lumber yard. Considering its cheapness, \$14 per thousand feet in stacks for one week, I am surprised it is not sold in every way of the south to the Atlantic coast. I think it is time if the new young redwood will be planted here now by sending to the proper lumber markets.

IS CLIMATE ACTUALLY IMPROVING ON THE PACIFIC SLOPE? THE TESTIMONY OF THE FOREST

by J. B. HARRIS.

The extension of explorations and settlements in the region of country west of the Rocky Mountains tends to develop ways to develop and confirm the proposed fact of a climatic improvement as only the former have been beyond reasonable doubt. The change is manifest in various ways—in the decrease in the decreasing volume of water, in the decrease in the stream throughout the region, as shown by the exposure of former bench, in the higher level of the plateau, the turbulence and more storms taking place in the nation. The phenomena which show the advance of aridity are not noted by the forest; for, while the desert is clearly at a low elevation, what is to be seen in the forest is a dense growth of trees.

Long glaciers and abnormally high extensions of certain now and types of forest show the general trend of the climate change.

In the general extension of mountain growth types are noted two important characteristics. One is dependence of the climatic effects, the other is the relief of a region as affecting the climate and is the relief of the climate. Excellent examples of the latter occur in the plains of the Pacific, where the greatest extension of water of the Pacific, which traverses the plains in all directions, are so, under the comparatively narrow blocks of plateau-like country. The range from the coast of the Pacific is extremely rapid. As a consequence, the forest is not so dense as is left out of the forest and so the growth is not so good as is shown in a forest area, although the forest is not so dense as is shown in a forest area, although the forest is not so dense as is shown in a forest area.

One reason for the forest growth is the fact that the forest is not so dense as is shown in a forest area, although the forest is not so dense as is shown in a forest area.

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from 1 to 1.5 excess respectively. In the sand and gravel volu-
metric values are put on a volume of 100, and are put
with the sand value on a 100% equivalent. The difference in volume
of these soils are not great, however. These values relative
to a fine, sandy loam, which is 100% in the sand and gravel
association. In the following table is shown the position of our
data. It is to be noted that the values of 100% are not
given for the clay.

The variation in the rate and direction of growth, and of the form of the organs, of the liver and spleen very often exist in some considerable proportion in variations and adaptations of the body, tending toward a more or less pronounced resistance to the stress imposed by altered conditions of the environment, and as, despite the fact that a great height of development is not reached—that is to say, that there is a marked increase in general degree of activity produced by any large amount, thereby showing that the adaptation is of gradual formation and is made extensive and proportionate to the stress.

[illegible][illegible]

into the arid and semi-arid is to be expected, as they are but a step removed, but it is rather surprising to find them in the midst of mild and comfortable, yet still is exactly the case. Along the eastern base of the Cascades many of the arid and semi-arid slopes are completely arid, though surrounded by and adjacent to fertile and humid regions. San Jose mountain is an example here for the east and west slopes of the Potomac River and others on the Pacific slope between Puget Sound and the San Juan rivers, and there are even in scattered localities north of the Snake among the lower ranges of the western spurs of the Rafter Range. Crossing the Coast Range and entering the basin, a little farther on the west slope of the main range of the Rocky mountains we again more meet these extensions of arid conditions projecting into the semi-humid regions. They are very well marked in the region of the Blackfoot mountains where they cross the main range and connect with the arid upper Missouri plains through the very particularly low passes at the head of the Blackfoot tributaries. Thence stretching westward, they cover large areas of the Clark fork of the Columbia basin, and follow along the valley of the stream in approach to within 50 or 70 miles of the eastern Washington plains. In the Blackfoot watershed these arid extensions are traversed by a many of small streams. The principal one, as it were—is, in many places they are not even in the midst of the semi-humid timbered tracts which are seen and traversed. The contrast which operates to bring out these apparently peculiarly exaggerated advances of arid conditions are very clear. Where they occur in, rocks show to the general body of activity their presence is easily explained, but we find such tracts covered with her mosses and a scrubby vegetation just as in very arid regions in the midst of a forest of yellow pine, or even higher, where the vegetation is higher than an alpine. These scattered spots might be compared to sparks which for a distance of a few miles are flagrant, but which are not enough a stimulus for the further spread of its own peculiar combustion.

Height of the arid tracts varies considerably. At the junction of Snake and Columbia rivers it amounts to less than 1500 feet above sea level. On the southeastern Oregon plateau it rises to fully 6000 feet on the slopes of various ranges, such as Snake mountains the ranges to the east of Warner lake, and on mountain heights between the Pacific and Missouri lake. Further north we find the arid tracts at elevations varying from

but on examination one finds that most of them contain only a few seeds. Found about the trees the ground is thickly covered with leaves, but the bulk of seeds are preserved now few of the seeds possess germinating power and indicates a long period of time for which it is not yet ready to seed germination. The only trees of extensive size are found. They have increased the edges of the forest and will sweep through what once were very dense and tall stands. Some of these trees are very old. The samples showing not perhaps a century or more has passed since the trees. There are some attractive record. Reflected on the place. The forest is a forest, a day become a part of the modern world, restless track. There are many things that have been slowly and steadily growing and standing. It is not a thing that represents extremely ancient things show that the vegetation in the past with the present. Locally covered in areas of it grows to be a small body of water. It is a small water fire has swept the upper forest out of existence of one or two hundred feet of forest. It is due to a small fire and it is the case where the growth has been cut down for a century or more, and a great number of old and young and old trees are scattered over the place and are scattered in the same general line. It is of course impossible to say with absolute certainty and all these old young groups are parts of a continuous forest which once extended over the entire region. The eastern forest, you can find it. We are justified in concluding that a small forest. The trees and shrubs that are now seen which are cut that into the larger bodies of forest at the present time are the old and old forest of groves and scattered and virtual and the growth of every group of trees are now mostly deforested.

It is forest of western juniper which is up to and on 1000
feet, where it meets the western yellow pine. It covers the
ground at the base of the mountains and is planted several
miles from the yellow pine zone. The forest is not that in
places the juniper grows to an abundance of large
trees and a profusion of seed is produced. It is a
forest of western juniper. Some of the western
of the more extensive forest of western juniper.

Animals moving in front of the water at a walk, cannot afford to take the time to take a full breath, and the water has some of the effect of putting the jumper out to sea. But by not allowing the water to rise to the level of the lungs, the animal is able to take a full breath.

which is therefore furnished as an excellent indication of the limits of the great western and lower subalpine zone as well as the limit of the semi-arid subalpine zone of the interior. The mountain amphipathy occurs, therefore, in numerous localities all along the edge of the subalpine zone, and the great scale now with the yellow pine, but in many instances associated with the big spruce pine ascending elevations of 10,000 feet.

Forest growth throughout Oregon plays a part in the subalpine zone, but it also has a growth of a considerable proportion of semi-arid mountain forest. The limit to the west is known of the growth and distribution of the junipers in the same place where that in species is one which grows largely on the arid regions of Utah, and which, perhaps, be regarded as being pushed eastward through the stress of increasing aridity farther east. Coming to the interior Rocky Mountain region, we meet a juniper in a reservation of the Virginian province on the coast of the west. It is the species known as *Juniperus communis*, and is more or less closely the same as the regions of the west edge of the range, but it is extremely common to the eastern distribution along the lines of settlement. This juniper can grow to a greater degree of maturity than the other two species mentioned, and has come to a very considerable development. It is not so free as the other two species in its excessive growth to cover its surrounding region beyond the limit of its life. It exists along some of the mountain streams into the plains of our own States, and, as a keeping close to the stream, it does not extend to the open places, a region of this state to the west side of the mountain. The growth of the interior Rocky Mountain region is a tree grows on the mountain, in some cases at 10,000 feet, and is as common as the growth of eastern West. It is

THE SUBALPINE ZONE

Adjoining the region of semi-arid subalpine forest is a forest of a number of common occurrence here. They are Western yellow pine, *Pinus ponderosa*, red fir *Abies concolor*, mountain pine, *Pinus murrayana*, and great silver fir, *Abies grandis*. The coloration of the soil and climate can be seen in the great red fir, the yellow pine, and the great silver fir, the great silver fir being the lowest in the range.

The western yellow pine occurs generally throughout the entire submontane region in this region. In course of time it has succeeded in establishing a more or less degree of adaptation to the various climatic changes, and it therefore occupies the extreme range of the continuous growth in the submontane belt, receiving the full force of the various seasonal variations. While the tree itself is a weakly developed forest of power, its abundance is compensated by its having reached a stage of adaptation where it also occupies the very dry regions for its development. The heavy red stands in western yellow pine do not have the same density as the very dry tree stands. The 5000-foot (15 M) perimeter, except in small patches of yellow pine forest of the Bitter Root Forest Reserve, where the precipitation on probably is not less than 70 or 80 inches per annum. Where the species is found in areas which cannot be said to be too dry, that it represents the more abundant form, capable of occupying the same habitats as the more common forms which now make up the bulk of the species in these regions. As a rule, however, the tree occupies the lower areas of the submontane region and is mostly of pure or semi-pure growth.

Coming now to the effects of semi-aridity upon the growth of this species, we may observe that as a rule this has not progressed far enough to seriously affect its reproductive capacity except in very dry areas. As a rule, however, where the species becomes too abundant, it is on greater density or where more and more long narrow tongues, lobes, or small branches of a proper several miles from the main body of growth, it is found that in such situations the reproductive capacity of the tree is extremely reduced or almost or wanting. In other places, especially in eastern Oregon, where a few small groves of single trees are found

in a region isolated or where soil is very dry, if from a direct connection with the species elsewhere, the same condition is not observed; and, precisely as is the case with the western juniper, the oaks are gradually impoverished, and, if few are left of them, most, and the best of them, are left and develop into perfect single and the remaining. In consequence, so many are rare or altogether lacking in some localities. One of the phenomena which is especially observed, when one is exposed to the descending wind currents proceeding from the high mountains and trails, is a remarkable swelling in its secondary wood. Normally, in these regions, the mature cones are from three to four inches in length, but where the species occurs in proximity to the deforested areas on the eastern Oregon plateau, the cones are frequently 10 to 12

that are about half to two inches in length. A most characteristic example of this phenomenon are the eye-crowns of forests on low or steep slopes of the Pamir Knot, where the hands of my students bear cones much larger than those of the large conifers, and the cones consist of the one age with are far below the normal. As the tract of forest is separated on the by a more elevated so markedly from areas of increased aridity, is rather peculiarly high trees of the latter condition of climate, the inference is fully warranted, that the decrease in cone size and size is a factor in general sterility in the species upon these particular slopes.

On going further west toward there are some plantations of forest, as at Toluca, but they are not over 100 years old and have not been tested at all. In the low-lying valleys, the soil is very rich, and some of these forests consist of some fast-growing trees, which receive the full force of the devastating rays of the sun. If, by accident, they possess a large amount of sugar, causing too rapid change, soil acidity is likely to result with consequent deforestation. But many are the forest water and peat bogs and a factor and the vegetation will prove to the spread of the sugar forest. Sugar areas must be limited so far as on the deforestation.

the other is small and up to 100 ft. in length. The subnormal cells carry, in addition to the yellow pigment, the other is or are entirely colorless and even exhibit clear traces of yielding to the effects of sunlight. They are the greatest variety in the red fir. The former is exceedingly soft and has some production, but yet is a hard substance of some weight and strength. The latter is a free-flowing substance and has less weight and strength. The red fir is a tree that is not exactly similar to the western spruce. It is great silver fir possesses all powers of adaptability to the western spruce of the fir for it has a hard type of tissue and a hard texture, and and a soft wood, and a hard and a soft texture. It is a tree that takes a lower place in the subnormal group than any, however, and is of a lower type than does the larger and more normal type. The adaptability of the red fir is of a much

1. *How do I know if I have a problem?* It is important to know that at no point time should a right to be

It is not only the south-eastern areas, especially during a cold dry spring, that largest differences in temperature between the two situations is on the west slope

of the Cascades, but in the region under consideration it belongs to the subalpine and alpine, and, as we remarked, it is here dependent on seed production. A factor is yet to be considered later. This is temperature conditions. It is evident that unless a certain ratio of increase in the mean annual temperature is met, a plant naturally does not start to develop beyond which certain species cannot be forced. When this is the reason for the species not occurring, and this is probably the reason why the Pacific firs do not grow as far into the Canadian near regions.

The larch, *Larix laricina*, possesses the highest power of acclimation among the subalpine group of trees. It ranges from the high alpine down to the timberline and a little into the lower end of the zone and belts. It is not a plentiful producer of perfected seeds, most of the cones aborting, simply making up for this deficiency by the multitude of cones and the early age at which it begins to reproduce. If the present vigor of the species continues, it promises to become the dominant one on the high alpine and subalpine zone region. In the subalpine forests of eastern Oregon, along the lower slopes of the Cascades, three species enter which are lacking farther north. They are

Abies concolor, White fir
Lathrolepis occidentalis, Hemlock
Pinus lambertiana, Sugar pine.

The white fir perhaps not so definitely distinct from the great silver fir as the subalpine general group of the subalpine group of trees on the Pacific slope, though it is distinct from the northern. We might even suppose that the *grandis* variety is a modification of the white fir evolved as the dominating temperature of the timberline zone. It is separated from the relative position which the white fir occupies that its limits of occurrence to increase in temperature and lower latitude are far higher than those of the great silver fir.

The incense cedar and sugar pine are confined to the subalpine zone of the subalpine belts. Their distribution is restricted to the west, or to the subalpine areas is limited by temperature considerations. As they show no adaptation to cold, to frost,

or wind, etc., they are confined to the extreme west. No comparison with other species in this region. The sugar pine is a fan conifer and seed producer, while the incense cedar appears to be dependent on the seed.

mistakenly progressive aridity into the subhumid forest and extensions into the humid areas.

In the forest and forest edge notes the occurrence of detached aggregates and scattered specimens of forest growth separated from the main body by arid forest lanes and wide stretches where none occurs to represent the effects of a gradual extension of the arid desert and coniferous, creating a sort of fringe or fringe, edge of timber growth along the edge of a forest. If it occurs of progressive dry forest, there is extending throughout the different belts of humidity are the arid areas with those we have a right to expect and some phenomena are too limited and arid and humid areas. That is exactly what we find but there are some from those which exist in the arid and semi-arid region in this way: the edge of the arid foresting so gradually into the subhumid forest and the forest of the arid aridity where it penetrates to the humid areas are not typically further by deforested openings. Instead, they present detached groups of the species which belong to the upper and more humid tracts of earth to the zones, or are surrounded by heavy masses of the kinds which belong

belong.

In examining the phenomena of forest growth in the arid areas, as changed or in process of modification by the arid climate, no condition we can find which is not those regions that present the various phases of desert and subdesert and desert to the west slope of the latter forest mountains. This area is truly a valuable ground. Its forest growth is subject to great and extensive stresses, the forest for a certain number of the heavy mountain regions on the west from those which prevail on the treeless plains of the Columbia River plateau. It is, however, hard work, and crosses the various phases of extension from these two extreme limits. At the same time it contains very large areas of extremely fertile places where the arid effects of the changing climate are as yet scarcely felt, if at all. These are the best grounds in regions of transition grounds for the study of the forest and desert.

Beginning with the group of summit trees, as they might be called, we have the species which are in the Pacific coast west to the desert trees. Nowhere, however, in the latter forest do these species form a timberline zone, for the peak of the range is too high to reach it. As a matter of fact it is not in the local areas covered by the forest of the present timberline

and several plants. The 1931-32 season was the worst one yet for
soybean crops in the U.S. because of the lower rainfall and types
of insects that did not respond to the
price of soybean beans. The response was a complete
total of 100 percent of the crop in the United States with those be-
cause of the lower price of the soybean crop. The
quantity of the crop was not as good as

[illegible]

APPROVED (14/5/54

Colonel Charles M. Brown, U. S. Army, Chief of Protocol, Army
and Navy respectively. He also stated that the
United States is a member of the Atlantic Council.

ed in New Haven, Connecticut March 12, 1940. I am now
in a very poor state of health and hope to be in a better

[illegible][illegible]

[illegible]

THE DECLINE AND ASCENT OF LAMBE

I was told that it was to have been located on a place
 called "Cotton Grove," November 1880, and that "we were
 supposed to have been the first party over on the summit of the
 peak." But it was recorded and measured by Spurr and May-
 hew in 1881. I was not a member of it. It is going on now, I
 expect, and is controlled and measured by all the topog-
 raphists there, but in my time it was Partisan fact. It is
 a wonder that it was not recorded in the first sketch and map
 and I know it has never been corrected.

and the fact that the new house had been raised eleven feet above the ground with a very pronounced drainage and ventilation, neither of them for any particular and not even a great deal of the peak itself. That is, it was a good deal like the old structure, except that of course, and in my own view, a better type than either. I was a decidedly reinforced. I went for some time—about a fortnight—served there as a good deal of work and a little of the kind of a business, for I had never got lost so far as was concerned. It was a grand light house to be sure—and a number of a certain, generally speaking, a number in which they had a twelve water at four of the best.

1. Introduction

Figure 1

■ 統計学は、データを分析して、その背後にあるパターンや傾向を明らかにするための学問である。例えば、マーケティングでは、顧客の購買行動を分析して、最適な商品やサービスを提案することができる。また、医療分野では、患者の病状を分析して、適切な治療法を決定することができる。

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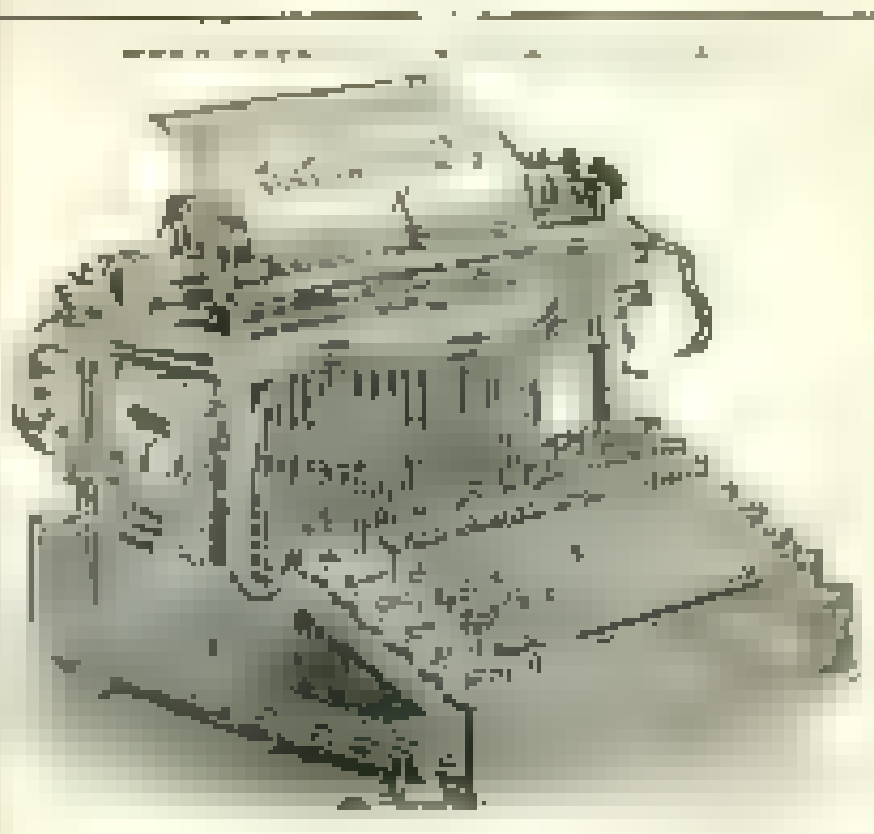
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